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Abstract

Design Problems in the D_2O-Moderated, Organic-Cooled Reactor Concept DOR

by

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A feasibility study of a heavy-water-moderated, organic-cooled power reactor called DOR is being carried out by the Danish Atomic Energy Commission at the Research Establishment Risö.

The aims of the feasibility study are summarized in the paper, and a description of the mechanical design of DOR is given. The heavy-water moderator is contained in a calandria tank, and hot pressure tubes containing fuel elements and coolant run vertically through the calandria tank. As fuel, UO_2 and UC clad with SAP are considered. SAP material is also used for the coolant pressure tubes through the core. Stainless steel is used for the calandria tank, which has zircaloy tubes rolled into the top and the bottom tube plate. DOR is designed for an output of about 250 MWe.

The mechanical design of coolant tubes, fuel elements and calandria tank is considered to present some of the major problems in the DOR project; therefore, efforts have largely been concentrated on the development of these components. Under research and development contracts, Danish industrial

companies are participating in this development work. In the paper the present design of the components mentioned above is discussed.

A survey of the experimental work which has been carried out is given. The experiments are related to coolant channels and calandria tank and comprise experiments with rolled joints between SAP and stainless steel and between zircaloy and stainless steel. Further, experimental investigations of the stiffness of calandria tube plates and of coolant pressure drop across the core are described.

Finally an account is given of the experimental work which is at the preparatory stage. These experiments are concerned with an out-of-pile loop with a DOR coolant channel in full size, an out-of-pile facility for the investigation of heat transmission with electrically heated dummy fuel elements, an organic in-pile loop, and test sections of the calandria tank.